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ANIMATION SCRIPT

YOUR PAIN IS MY PAIN: WHAT MAKES US FEEL EMPATHY?
DR VALERIA GAZZOLA AND PROFESSOR CHRISTIAN KEYSERS

TO MAKE THE MOST OUT OF THIS SCRIPT, YOU COULD:

- Stick it in your book as a record of watching Valeria and Christian's animation
- Pause the animation and make notes as you go
- Add your own illustrations to the sheet
- Create your own animation to accompany it
- Add notes from classroom discussions
- Make notes of areas you will investigate further
- Make notes of key words and definitions
- Add questions you would like answered – you can message Valeria and Christian through the comments box at the bottom of their article: **www.futurumcareers.com/your-pain-is-my-pain-what-makes-us-feel-empathy**

SCRIPT:

Why do we wince when we see someone hurt themselves? Why do we enjoy watching films? How is it that we can feel what others feel?

Understanding empathy is the work of The Social Brain Lab at the Netherlands Institute for Neuroscience in Amsterdam run by Dr Valeria Gazzola and Professor Christian Keysers.

Scientists used to think empathy was a three-stage process involving the brain's visual, reasoning and motor systems, but our understanding of empathy has changed dramatically.

Mirror neurons are brain cells that allow us to plan and sense our actions, and are also active when we watch someone else move. Our mirror neurons can sense what another body is feeling as if it were happening to our own.

Not only that, but Valeria and Christian believe that the motor system's role is not limited to acting after a reasoned decision has already been made – it is an integral part of perceiving the experiences of people around us.

In their studies, the researchers at the Social Brain Lab use functional magnetic resonance imaging (fMRI). When a brain cell becomes active, it requires oxygen, which is delivered by haemoglobin in the blood. The haemoglobin changes shape once it has released its oxygen, a change which disrupts the magnetic field of the fMRI machine. The team can measure changes in brain activity by studying these disruptions.

The researchers record brain activity when someone is experiencing pain and identify the brain regions involved in experiencing pain first-hand. Then, they show videos of other people experiencing pain and see that many of the same brain regions become active again. People feel someone else's pain similarly to how they feel their own.

fMRI is a non-invasive technique suitable for humans, but it cannot pinpoint the activity of individual neurons. Studies on rats are used to understand empathy at the cellular level.

Measuring the activity of individual neurons, the team at the Social Brain Lab found that the same neurons became active in the rat when in pain and when witnessing the pain of another. However, if they inhibited the area containing these emotional mirror neurons in the observer rats, the rats were no longer scared. These studies helped to uncover the precise 'wiring' behind this kind of empathy.

The lab has also shown that empathy can be increased by being told the person you are observing has a lot in common with you. But, empathy is reduced if you are told they are a competitor. There is evidence you can train yourself to become more empathic and, ultimately, change your own brain activity.

Another fascinating study has seen the Social Brain Lab investigating if and how psychopathic individuals experience empathy. Using fMRI, they found that when watching others in pain, psychopathic individuals had less activity in the pain region of their brains than the control participants, confirming the common notion that they have reduced empathy.

However, when asked to empathise with the person in the video, they had the same brain activity as the control group. This suggests that psychopathic individuals are not incapable of empathy but, rather, they do not feel it spontaneously.

Neuroscience is becoming ever more precise, with researchers like Valeria and Christian understanding how the responses of single cells lead to social interaction.

What would you investigate as a neuroscientist?